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54 Information recording discs.

57 An information recording disc (1) comprising a plurality of disc substrates (2a, 2b) at least one of which comprises a recording medium containing layer (1a, 1b), a hub (4) in two pieces (10) mounted on opposite sides of said disc (1), each hub piece having a portion (8) inserted into a center hole (3) of said disc (1) and a flange portion (9) covering a portion of a disc substrate (2a, 2b) in the vicinity of said center hole (3), and adhesive layers (13, 14) between a hub piece (10) and a disc substrate (2a, 2b) and between the two hub pieces (10).

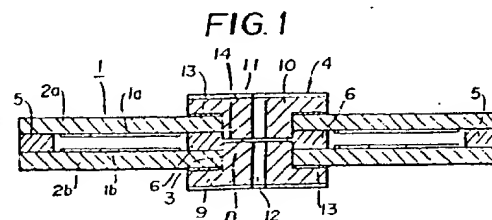


Fig. 3 is a sectional view showing a main body of hub.

Figs. 4 and 5 are sectional views showing comparative examples, respectively.

In the figures, the same signs represent the same or corresponding portions, where 1 is an information recording disc, 2a and 2b are disc substrates, 3 is a center hole, 4 is a hub, 5 is an outer peripheral spacer, 6 is an inner peripheral spacer, 7, 13 and 14 are adhesive layers, 8 is a portion of hub to be inserted into the center hole, 9 is a flange portion of hub, and 10 is a main body of hub.

DETAILED DESCRIPTION OF THE INVENTION

The information recording discs of the present invention comprise a plurality of laminated disc substrates usually two laminated disc substrates, at least one of which has a recording medium containing layer, two pieces of hubs to be mounted over the center hole of the laminated disc substrates on both sides thereof, each hub having a portion to cover a portion of the laminated disc substrate in the vicinity of the center hole, and adhesive layers to be formed between said hubs and said laminated disc substrates and between said hubs.

In the information recording discs of the present invention, a plurality of disc substrates usually two disc substrates, at least one of which has a recording medium containing layer, are laminated so that the recording medium containing layers face to each other, and these disc substrates may be laminated directly or via spacers with adhesives or by means of ultrasonic welding technique.

Materials used for forming the disc substrate, outer peripheral spacer and inner peripheral spacer are thermoplastic resins such as polycarbonates, polymethyl methacrylates and polyolefins. Preferably useful resins are copolymers of ethylene and cycloolefins represented by the following general formula [I] or [II]. Preferred copolymers are those which contain 40-85 mol%, preferably 50-80 mol% of ethylene. Particularly preferred resins for forming the disc substrate include, for example, cycloolefin type random copolymer compositions formed from components:

(A) a cycloolefin type random copolymer comprising an ethylene component and a cycloolefin component represented by the following general formula [I] or [II], said copolymer having an intrinsic viscosity $[\eta]$ of 0.05-10 dl/g as measured in decalin at 135°C and a softening temperature (TMA) of not less than 70°C, and

(B) a cycloolefin type random copolymer comprising an ethylene component and a cycloolefin component represented by the following general formula [I] or [II], said copolymer having an intrinsic viscosity $[\eta]$ of 0.01-5 dl/g as measured in decalin at 135°C and a softening temperature (TMA) of less than 70°C, the weight ratio of said component (A)/component (B) being 100/0.1 to 100/10. Preferably, the component (A) contains 40-95 mol%, preferably 40-85 mol%, more preferably 50-75 mol% of ethylene, and the component (B) contains 60-98 mol%, preferably 60-95 mol% of ethylene,

thereof and the adhesive layers are formed between said hubs and said disc substrates and between said hubs themselves, the information recording discs obtained thereby are excellent in anchoring strength by virtue of the fact that the laminated inner peripheral portion of said information recording discs is reinforced by a simple assembling operation.

EMBODIMENT OF THE INVENTION

The present invention is illustrated below with reference to embodiment as expressed in terms of figures shown in the accompanying drawings. Figs. 1 and 2 are sectional views showing separate embodiments of the information recording discs of the present invention, respectively, and Fig. 3 is a sectional view showing a main body of the hub.

In the figures, 1 is an information recording disc of a structure wherein the hubs 4 are fitted in a center hole of two disc substrates 2a and 2b being laminated so that recording medium containing layers 1a and 1b face to each other. In Fig. 1, the disc substrates 2a and 2b are superposed upon each other via an outer peripheral spacer 5 and an inner peripheral spacer 6 and laminated by the ultrasonic welding technique to an air sandwich structure, whereas in Fig. 2 said disc substrates 2a and 2b are directly laminated with an adhesive layer 7. The hubs 4 each comprise a main body 10 made of plastics and having a portion 8 to be inserted into the center hole 3 and a flange portion 9, a metallic plate 11 being fixed to the surface of the main body 10, and a hole 12 perforated at the center thereof. The metallic plate 11 is anchored to the hub main body 10 by means of cut and raised points of projections formed on said metallic plate 11 and so designed as to be driven by mechanical or magnetic force (detailed diagrammatic illustration in this respect is omitted). The portions 8 of the hubs 4 are so designed to be inserted into the center hole 3, and the flange portions 9 of the hubs 4 are so designed to cover the laminated disc substrates 2a and 2b in the vicinity of the center hole 3. Adhesive layers 13 are formed between the flange portions 9 of the hubs 4 and the laminated disc substrates 2a and 2b, and an adhesive layer 14 is formed between the portions 8 of the hubs 4, and thus all the constituents parts are integrally anchored to one another to a solid structure.

The information recording discs 1 comprising the constituent parts as shown in Figs. 1 and 2 are manufactured by laminating the disc substrates 2a and 2b directly with the adhesive layer 7 or by means of the ultrasonic welding technique via the outer peripheral spacer 5 and the inner peripheral spacer 6 so that the recording medium containing layers 1a and 1b face to each other, inserting the portions 8 of the hubs 4 into the center hole 3 from both sides thereof, charging the adhesive layers 13 between the flange portions 9 of the hubs 4 to anchor them to each other, and charging the adhesive layer 14 between the portions 8 of the hubs 4 to anchor them to each other.

In the information recording discs 1 thus manufactured, since the hubs 4 are in contact with the disc substrates 2a and 2b by way of the portions 8 and flange portions 9 of said hubs 4, and the hubs 4 themselves are bonded to each other by means of the adhesive layer 14 while the hubs 4 and the disc substrates 2a and 2b are bonded to each other by means of the adhesive layers 13, all the constituent parts are integrally formed to a solid structure, whereby the inner peripheral portion of the solid structure is reinforced to increase lamination strength thereof.

Figs. 4 and 5 are sectional views showing comparative examples of information recording discs, respectively. The information recording discs respectively represented by Figs. 4 and 5 are similar in structure to those shown in Figs. 1 and 2. In these information recording discs, however, the portions 8 of the hubs 4 to be inserted into the center hole 3 is short in length and no adhesive layer is formed between said portions 8 for the purpose of bonding them to each other. Accordingly, in the information recording discs as shown in Figs. 4 and 5, respectively, the inner peripheral portion thereof is low in strength.

Illustrated below are test examples of the information recording discs of the present invention and comparative examples.

In the information recording discs of Figs. 1, 2, 4 and 5, respectively, the aforementioned polyolefin resin was used for forming the disc substrates 2a and 2b, and the outer peripheral spacer 5 and inner peripheral spacer 6, polycarbonate was used for forming the main body 10 of the hubs 4, and an epoxy type resin was used for forming the adhesive layers 7, 13 and 14, respectively. The disc substrates 2a and 2b both had an outside diameter of 130 mm, an inside diameter of 15 mm, and a thickness of about 1.2 mm. The main body 10 of the hubs 4 of Fig. 1 had A = 15 mm, B = 25 mm, C = 4 mm, D = 1.45 mm and E = 2 mm in the main body 10 as shown in Fig. 3, while the value of D in the main body 10 of Figs. 2, 4 and 5, respectively, was varied. These information recording discs as illustrated above were subjected to drop test wherein they were allowed to drop from a height of 1 m.

As the result, debonding was partly observed in the outer peripheral space 5 of the disc of Fig. 1 when dropped 15 times, and the test was continued, whereupon no debonding of the hubs 4 and the inner peripheral spacer 6 was observed even when said disc was allowed to further drop 50 times. Furthermore, the disc shown in Fig. 1 had an adhesion strength of at least 10 kg/cm² between the hub and substrate, and also passed the delamination test continuously repeated at least 100,000 times. The disc of Fig. 2 was kept for 1000 hours in an oven at 70°C and 90% RH, and then subjected likewise to the test, whereupon no debonding of the hubs 4 occurred even when said disc was allowed to drop 50 times. In contrast thereto, debonding was partly

FIG. 1

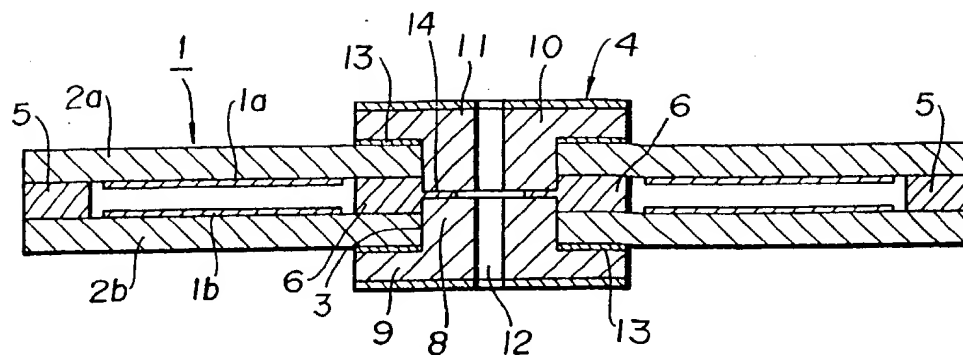


FIG. 2

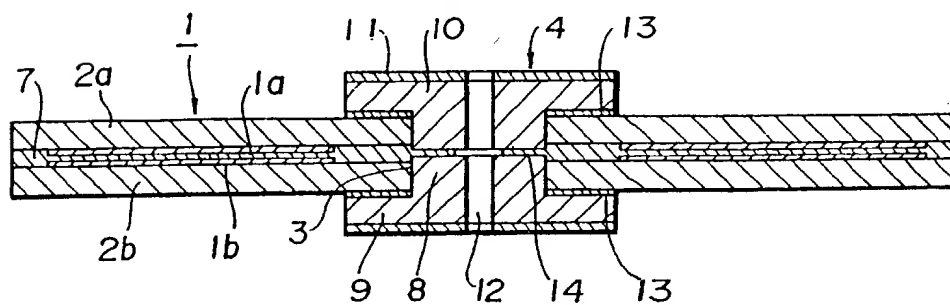
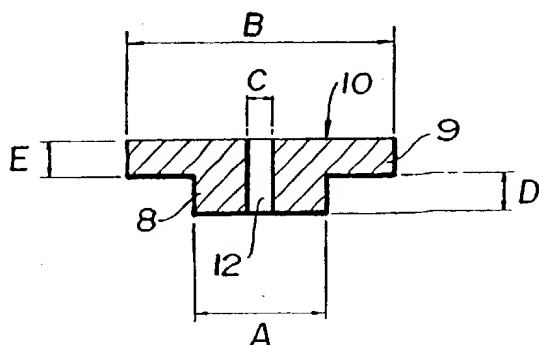


FIG. 3





DOCUMENTS CONSIDERED TO BE RELEVANT			EP 88306920.5
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	EP - A1 - 0 192 244 (HITACHI MAX-WELL LTD.) * Fig. 13,15,16; page 15, line 12 - page 18, line 17 * -----	1-3	G 11 B 7/24 G 11 B 7/26
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			G 11 B 7/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 03-11-1988	Examiner BERGER
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	